

JOINT TUFTS/MIT COSMOLOGY SEMINAR

Unimodular Henneaux-Teitelboim (HT)

Gravity: 4D and 2D applications

Bruno Alexander
Imperial College London

Unimodular Henneaux-Teitelboim (HT) Gravity provides a fully diffeomorphism-invariant route to unimodular gravity by promoting the cosmological constant to a conjugate variable with an associated “unimodular time”. I will present two complementary applications. In 4D minisuperspace, starting from the connection representation, unimodular Hartle-Hawking wave packets yield a unitary inner product and normalizable states whose peaks track classical FRW dynamics. This work reframes “creation from nothing” as the emergence of a semi-classical Universe from interference of incident/reflected packets near the bounce, without invoking Vilenkin’s contour. In parallel, I will introduce a 2D cousin obtained via a centrally extended JT/KSY construction. In de Sitter quantum cosmology, superposing Lambda-eigenstates produces unitary evolution in unimodular time, controlled interference near $T=0$, and sharply separated WKB branches at late times. The same mechanism naturally accommodates transient quantum deformations of global dS and suggests a topology change interpretation in which contracting/expanding branches play the role of Universe/anti-Universe pairs.

Tuesday, November 18, 2025, 2:30 pm

574 Boston Ave, Room 316

Tufts University

Refreshments at 2:00 outside room 304